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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:

(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.

If no title is shown please refer to the description.

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Multimedia massaging service and system

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Multimedia messaging service and system

Multimedia Messaging Service (MMS) is a standard that lets users send and receive multimedia messages with formatted text, graphics, audio and video clips. MMS messages can be sent to (MMS enabled) mobile phones or standard e-mail addresses. The sending entity can for instance be a mobile phone or an application running on a computer.

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Fig. 1 shows the generic MMS Person-to-Person flow. A first person wants to send an MMS message to a second person. He takes his mobile phone, composes the message and includes one or more multimedia objects in the message. After hitting the "send" button, the multimedia message (text and the multimedia objects) is transmitted over the mobile network to a Multimedia Messaging Service Center (MMSC).

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The mobile network could be e.g. GSM, GPRS, UMTS or a comparable system. As multimedia messages can potentially grow very big, a broadband mobile network is preferred. The first person could also have composed the message on his personal computer connected to the Internet. The message would then have been sent to the MMSC over the Internet. Other ways to transmit multimedia messages are of course also possible. It is important to note that the message is always sent to the MMSC and not directly to the recipient. This architecture is an example of a store-and-forward messaging system.

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The multimedia message is received by the MMSC. From there it is forwarded to the intended recipient (the second person). The multimedia message is once more transmitted over a mobile network, this time to the mobile telephone of the second person. Upon arrival of the multimedia message, this mobile telephone processes the content and presents the message to the second person. The two mobile networks in question may or may not be the same.

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In the above example, the first person used the second person's telephone number as the address to which the multimedia message was to be sent. He could also have used the second person's e-mail address. The multimedia message would then have been forwarded by the MMSC to the second person's e-mail box, from which the second person could have read it using a standard e-mail client.

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Fig. 2 shows the generic MMS Application-to-Person flow. Multimedia messaging is of course not restricted to messages sent by persons to persons. Many automated services can be offered. For instance, a popular service is the making available of ringtones or logos for mobile telephones. In such an application, a user can send a request for a particular ringtone or logo to a server from his mobile telephone. An application on the server retrieves the appropriate ringtone or logo and transmits it as a multimedia message to the MMSC. Once the message arrives at the MMSC, it is handled and forwarded in the same way as described above with reference to Fig. 1. When the mobile phone receives the multimedia message, it extracts the ringtone or logo.

Delivering ringtones and logos is already very popular with the standard text-based Short Messaging Service (SMS). However, MMS has a much broader application. A potential use of Application-to-Person MMS is the provision of (high) value content. An example could be a service which can provide the latest music samples or video clips. The user pays an extra amount for that message to cover the content licensing costs, as most of this content is copyrighted or protected by other intellectual property rights.

A problem occurs if both presented models are combined: The user who paid for the content (application-to-person) can forward this message (and thus the content) to another user (person-to-person), only paying for the transmission of the message, but not paying any license fees due for forwarding the content.

It is an object of the invention to be able to prevent content from being forwarded, or at least to be able to restrict such forwarding.

This object is achieved according to the invention in a method and a system which is capable of "tagging" the content transmitted in a multimedia message with a watermark before sending it to the recipient. Preferably, such tagging is done in the store-and-forward component of the system. In the system as described above this would be the MMSC.

An illustration of a preferred embodiment of the invention is shown in Fig. 3. In this case, the MMSC is extended with a watermarking system through which all content present in multimedia messages must pass. The watermarking system detects the type of content in the multimedia messages (e.g. audio, video, text and so on), chooses an appropriate watermarking scheme for the detected type of content, and embeds a marker in the content using the chosen watermarking scheme.

The marker does not have to be very big, and does not need to contain a lot of information. As will become apparent below, the most important aspect is that it is possible later to determine *that* the content has been watermarked. The content of the watermark is not very important, but it must be very difficult or impossible to remove a watermark from the content. This makes robust watermarking techniques the best choice, as they typically have a low payload but are very difficult to remove.

Of course it is not forbidden to add meaningful content as the payload of the watermark. For example, the name of the entity that added the watermark, or an identifier for the recipient of the multimedia message could be embedded.

The MMSC is also provided with a watermark detector, as shown in Fig. 4. Before adding a watermark, the content of the multimedia message is passed through the watermark detector. If a marker can be found, this indicates that the content has passed through an MMSC previously. This is proof that the content is being forwarded. As such forwarding is to be prevented or at least restricted, the MMSC can now take appropriate action.

The simplest action is to simply delete the multimedia message rather than forwarding it. However, this may not be acceptable to users. Usually one part of the message (such as a picture or ringtone) represents forwarded content. Other parts, such as accompanying text messages or pictures, are original content. The original content should not be blocked simply because there is also a forwarded part in the message. The MMSC could strip out this forwarded piece of content and pass on the remaining parts of the multimedia message. Preferably, any parts that have been stripped out are replaced by a message indicating that they have been stripped out and why.

Alternatively, a license fee required for forwarding the content could be computed. This license fee can then be charged to the sending user's account, if this information is available. This could work well e.g. with music content, as music rights clearinghouses are available to negotiate a general compensation or license fee.

The MMSC could also convert the content to a relatively low quality version before forwarding the content to the intended recipient. This way, the intended recipient would still get the message and the content, but because of the low quality it would not be very valuable. He would then be encouraged to download the original version from the MMS application himself.

If a meaningful payload is present in the watermark, the watermark detector can extract this payload and take appropriate action based on the extracted information.

For example, if the extracted information identifies the initial recipient of the content being forwarded (i.e. the person who received it from the MMS application server in Fig. 2), the MMSC could compare this identifier against an identifier for the sender of the intercepted multimedia message. If these two are the same, it could permit forwarding. This way, the initial recipient can forward content to his friends, but those friends cannot pass the message on to anyone else.

Alternatively, the identifier could be used to track down the initial recipient of the content, so that he can be charged a fine, or so that he can be blocked from using the MMS application.

10 If the extracted information identifies the MMSC which added the watermark, or the operator of one or more MMSCs, the MMSC could allow forwarding of the message if it were the same MMSC as the MMSC which added the watermark. This permits forwarding only to and from users of the same MMSC.

The watermarking system and the watermark detector can be embodied as
15 separate devices to be installed in the MMSC. They can also be embodied as one single device. They can be embodied in whole or in part in hardware or in software.

The entity operating the MMSC is able to optimize content at the MMSC for the receiving user agent. This can be the adaptation of the format (for images e.g., GIF to JPEG), the size (for video e.g., from CIF to QCIF), the bitrate (for audio e.g., 128kbps to
20 20kbps) and other parameters. This is shown schematically in Fig. 5. Since this media mediation system has access to, and knowledge about the multimedia content of the message, the watermark embedding and detection systems are preferably positioned in this system.

An illustrative embodiment of an MMSC is shown schematically in Fig. 6. The functionality of the MMSC can be divided conceptually into a server portion and a relay portion. Briefly speaking, the Server provides the store-and-forward architecture and the
25 Relay transcodes and delivers the messages.

A message is received by the receiver component of the server. The message is processed to detect how it should be handled and to whom it should be forwarded. In accordance with the invention, the contents of the message is processed by a watermark
30 detector to detect whether the multimedia content of the message has already been forwarded. If such detection is positive, the MMSC takes appropriate action, as explained above.

If forwarding of the message is acceptable, there are several possible paths the message can take. Usually the message will be passed on to the relay. The relay takes care of the watermark embedding and transcodes the message to a form suitable for handling by the

recipient. The message is then passed on to the mobile network so that it can be delivered to the intended recipient.

The message can also be passed on to an SMTP interface. This interface formats the multimedia message in accordance with Internet e-mail standards, and then forwards the message as an Internet e-mail message to the intended recipient. The SMTP interface may or may not embed a watermark in the multimedia message before forwarding it. If the SMTP interface watermarks the content, further forwarding of the resulting e-mail message to another recipient via the MMS network becomes impossible. However, as the Internet e-mail network is not very strictly regulated, it will be very difficult to enforce forwarding restrictions over the e-mail network itself.

If the recipient is not on the same mobile network as the sender of the multimedia message, the relay cannot forward the message itself to the intended recipient. In this case, the server passes the message on to an MMSC which is connected to the correct mobile network. It is then the responsibility of this other MMSC to embed the appropriate watermark before forwarding the multimedia message to the intended recipient.

The watermark detector can also be positioned in the relay portion of the MMSC. This has the advantage that the detector and embedder could e.g. be realized as a single device. However, if a particular multimedia message is then passed on to another MMSC which does not have a watermark detector in accordance with the invention, there is a risk that the content is forwarded multiple times, which is not permitted.

Watermark embedding can also be implemented as part of the transcoder module. Content received by an MMSC from an MMS application will often be of relatively high quality. As most mobile devices will not be able to directly handle such high quality content (due to e.g. low resolution displays, low quality loudspeakers or headphones), transcoding to a format suitable for the mobile device is necessary.

By making the watermark embedding part of the transcoding process, one can make sure that the watermark survives the destructive operations associated with the transcoding process. For example, if a 24-bit picture in the TIFF format is converted to an 8-bit grayscale GIF image, a watermark that is embedded in the color components of the original image can be severely distorted. If however, the watermark were embedded after the conversion to 8-bit grayscale but before the compression to the GIF format, the final picture will be correctly watermarked.

The functionality of the transcoding module can be extended to more than just converting between formats, sizes, bitrates etcetera. For instance, an interface with MMS

applications could be provided. This way, an MMS application could for instance dynamically generate content specifically adapted for one particular mobile device.

5 It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. The invention is of course applicable to any store-and-forward system, not just the MMS system described above.

10 It is for instance also possible to implement the watermark detection and embedding functionality according to the invention in an Internet or Intranet e-mail server system. This way e-mail messages cannot be used to indefinitely forward multimedia content. Analysis of the contents of e-mail attachments is already done by antivirus software, and a similar approach could be used to implement watermark detection in attachments.

15 In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed in a claim. The word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The invention can be implemented by means of hardware comprising several distinct elements, and by means of a suitably programmed computer.

20 In the device claim enumerating several means, several of these means can be embodied by one and the same item of hardware. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

CLAIMS:

1. A method of controlling retransmission of a content item contained in a multimedia message, comprising
receiving the message containing the content item from a sender together with an identifier of an intended recipient of the message,
5 processing the content item to detect the presence or absence of a watermark therein,
if the absence of a watermark has been detected,
 - causing a watermark to be embedded in the content item, and
 - allowing retransmission of the message including the watermarked content item to the intended recipient,
10 and otherwise restricting retransmission of the message including the content item to the intended recipient.
2. The method as claimed in claim 1, in which restricting retransmission comprises disallowing retransmission of the message.
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3. The method as claimed in claim 1, in which restricting retransmission comprises allowing retransmission of the message but disallowing retransmission of the content item.
- 20 4. The method as claimed in claim 1, in which restricting retransmission comprises
 - charging a fee to the sender of the message,
 - causing a watermark to be embedded in the content item, and
 - allowing retransmission of the message including the watermarked content item to the
25 intended recipient.
5. A system arranged for controlling retransmission of a content item contained in a multimedia message, comprising

receiving means for receiving the message containing the content item from a sender together with an identifier of an intended recipient of the message,

watermark detecting means for processing the content item to detect the presence or absence of a watermark therein, and for signaling to conditional retransmitting means the presence or

5 absence of a watermark,

the conditional retransmitting means being arranged for, conditional upon receiving a signal indicating the absence of a watermark,

— activating watermark in means for embedding a watermark in the content item, and

— activating retransmitting means for retransmitting the message including the watermarked

10 content item to the intended recipient,

and for otherwise restricting retransmission of the message including the content item to the intended recipient.

6. A media transcoding system, arranged for transcoding content items in a
15 multimedia message to a format suitable for an intended recipient, comprising the system of claim 5.

7. A computer program product arranged for causing a processor to execute the method of claim 1.

A system for and method of controlling retransmission of a content item contained in a multimedia message. The method comprises:

- receiving the message containing the content item from a sender together with an identifier of an intended recipient of the message,
- processing the content item to detect the presence or absence of a watermark therein,
- if the absence of a watermark has been detected,
 - causing a watermark to be embedded in the content item, and
 - allowing retransmission of the message including the watermarked content item to the intended recipient,
- and otherwise restricting retransmission of the message including the content item to the intended recipient.

Fig. 1

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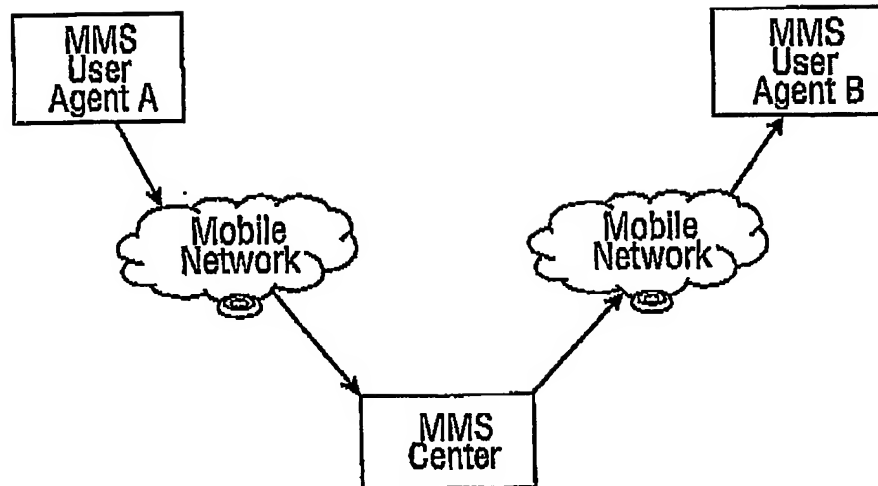


FIG.1

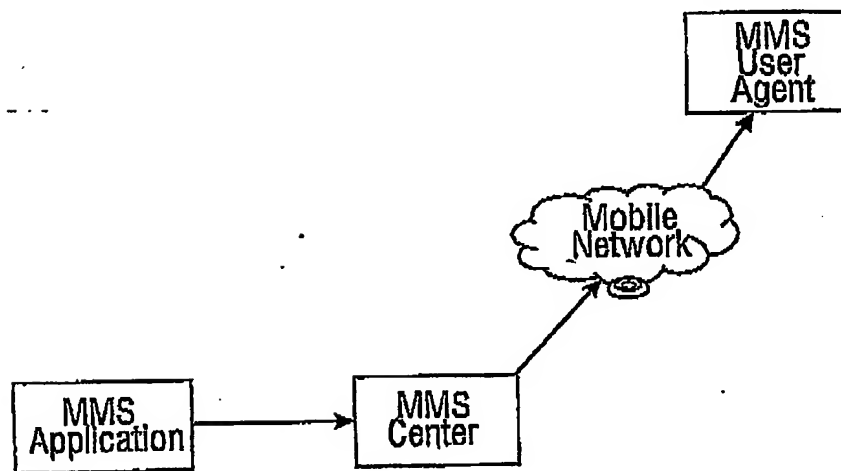


FIG.2

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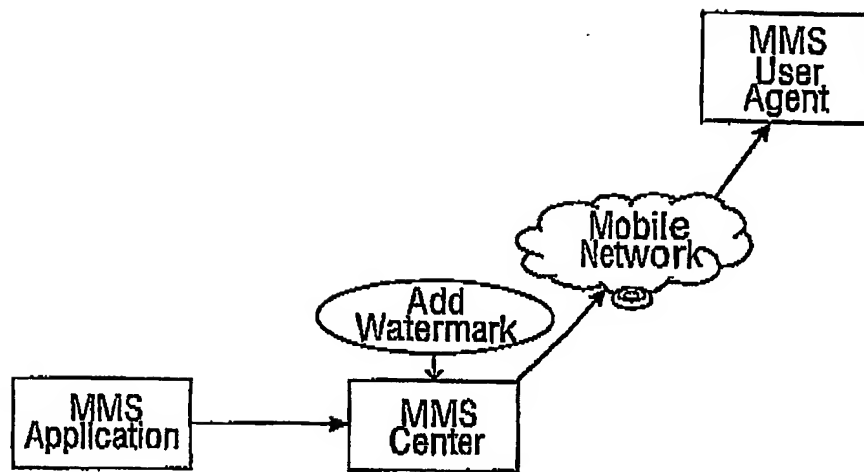


FIG.3

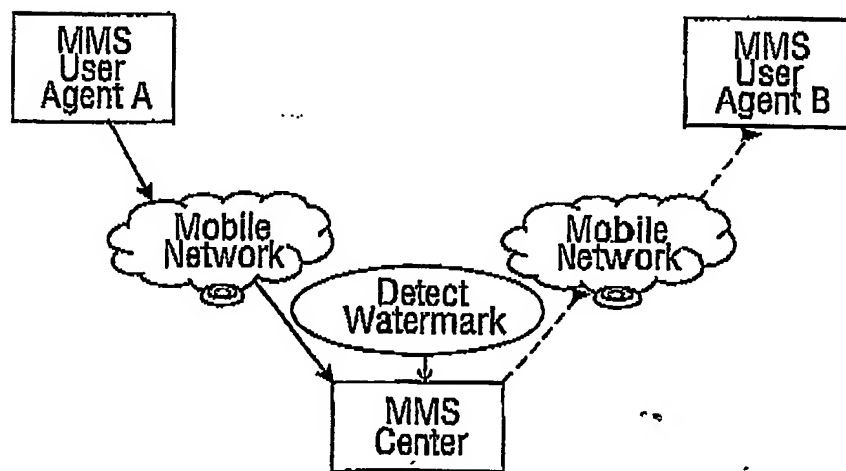


FIG.4

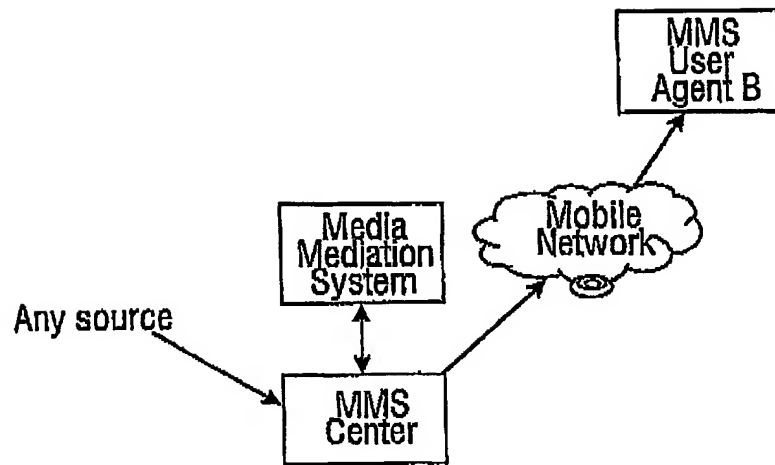


FIG.5

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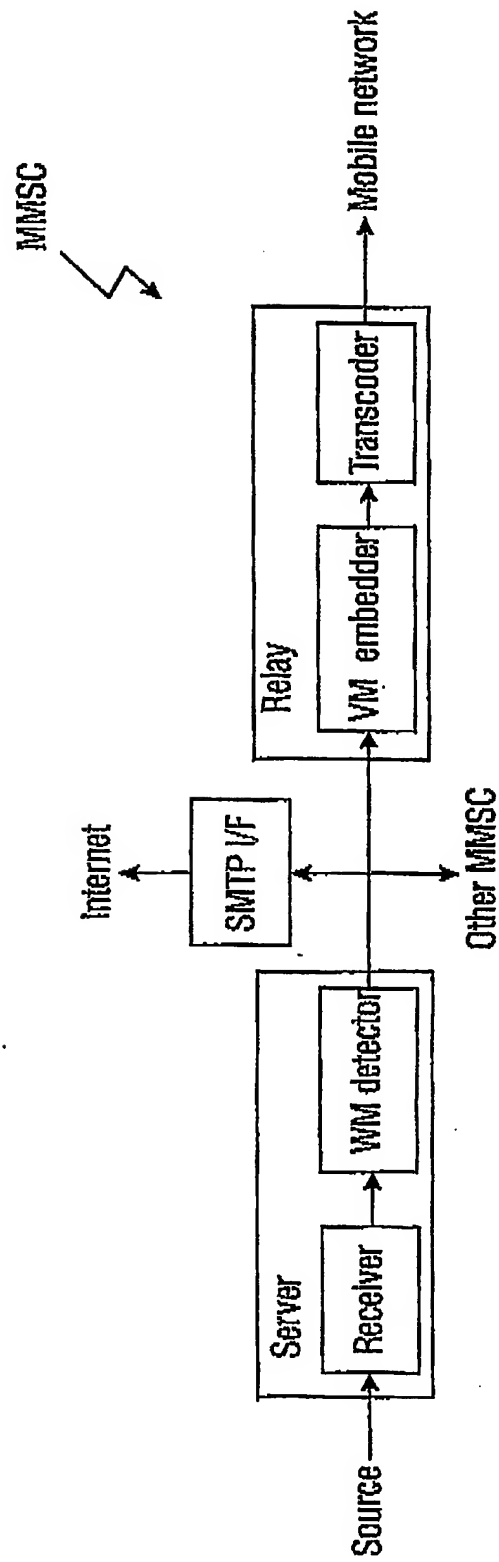


FIG.6